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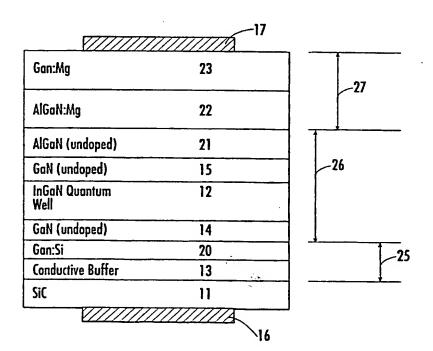
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(54) Title: VERTICAL GEOMETRY InGaN LED



(57) Abstract

A vertical geometry light emitting diode is disclosed that is capable of emitting light in the red, green, blue, violet and ultraviolet portions of the electromagnetic spectrum. The light emitting diode includes a conductive silicon carbide substrate, an InGaN quantum well, a conductive buffer layer between the substrate and the quantum well, a respective undoped gallium nitride layer on each surface of the quantum well, and ohmic contacts in a vertical geometry orientation.

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VERTICAL GEOMETRY INGAN LED

FIELD OF THE INVENTION

This invention relates to light emitting diodes (LEDs) formed from Group III nitrides (i.e., Group III of the Periodic Table of the Elements), and in particular relates to LEDs that incorporate indium gallium nitride (InGaN) quantum wells as the active portion to produce output in the red to ultraviolet portions, and particularly the green to ultraviolet portions, of the electromagnetic spectrum.

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BACKGROUND OF THE INVENTION

Light emitting diodes ("LEDs") are p-n junction devices that have been found to be useful in various roles as the field of optoelectronics has grown and expanded over the years. Devices that emit in the visible portion of the electromagnetic spectrum have been used as simple status indicators, dynamic power level bar graphs, and alphanumeric displays in many applications, such as audio systems, automobiles, household electronics, and computer systems, among many others. Infrared devices have been used in conjunction with spectrally matched phototransistors in optoisolators, hand-held remote controllers, and interruptive, reflective, and fiber-optic sensing applications.

An LED operates based on the recombination of electrons and holes in a semiconductor. When an electron carrier in the conduction band combines with a hole in the valence band, it loses energy equal to the bandgap in the form of an emitted photon; *i.e.*, light. The number of recombination events under equilibrium conditions is insufficient for practical applications but can be enhanced by increasing the minority carrier density.

In an LED, the minority carrier density is conventionally increased by forward biasing the diode. The injected minority carriers radiatively recombine with the majority carriers within a few diffusion lengths of the junction edge. Each recombination event produces electromagnetic radiation, *i.e.*, a photon. Because the energy loss is related to the bandgap of the semiconductor material, the bandgap characteristics of the LED material have been recognized as being important.

As with other electronic devices, however, there exists both the desire and the need for more efficient LEDs, and in particular, LEDs that will operate at higher intensity while using less power. Higher intensity LEDs, for example, are particularly

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OMNIBUS SEALING STIPULATION AND [PROPOSED] ORDER RE: YOUTUBE'S CUSTODIANS

Case 4:22-md-03047-YGR

CASE No.: 4:22-03047-YGR

ATTESTATION

I, Christopher Chiou, hereby attest, pursuant to N.D. Cal. Civil L.R. 5-1(i)(3), that the concurrence to the filing of this document has been obtained from each signatory hereto.

Dated: May 29, 2024

By: <u>/s/ Christopher Chiou</u>
Christopher Chiou

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8	U.	NITED STATES I	DISTRICT COURT	Γ
9	FOR THE	NORTHERN DIS	TRICT OF CALIF	FORNIA
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11	IN RE: SOCIAL MEDIA ADO ADDICTION/PERSONAL IN) MDL No. 304	7
12	PRODUCTS LIABILITY LIT		CASE NO.: 4	:22-md-03047-YGR
13)))	LOBBED ON
14	THIS DOCUMENT RELATE ALL ACTIONS	S TO:	DEFENDAN] ORDER ON IS YOUTUBE, LLC AND
15) GOOGLE LI) TO SEAL	LC'S OMNIBUS MOTION
16)	
17			Honorable Yv Honorable Pet	onne Gonzalez Rogers er H. Kang
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CASE No.: 4:22-03047-YGR

[PROPOSED] ORDER RE: YOUTUBE'S CUSTODIANS

Pursuant to Civil Local Rules 7-11 and 79-5 and the Court's May 22, 2023 Protective Order (Dkt. No. 290) and August 1, 2023 Order Granting Motion To File Under Seal; Setting Sealing Procedures (Dkt. No. 341), and after consideration of the moving, opposition, and reply papers, supporting declarations, the arguments of counsel, and all other matters presented to the Court, the Court rules that good cause exists to seal portions of the following documents relating to Joint Letter Brief on Whether YouTube Must Designate Additional Custodians:

Dkt. No.	Description	Requested Action	Court's Ruling
848	Joint Letter Brief on Whether YouTube Must Designate Additional Custodians	Maintain redactions at 1, 2, 3.	Granted
			Denied
849	Exhibit A to Joint Letter Brief on Whether YouTube Must Designate Additional Custodians.	Seal in entirety.	Granted
			Denied

IT IS SO ORDERED.	
DATED:	
	HONORABLE PETER H. KANG
	UNITED STATES DISTRICT JUDGE

CASE No.: 4:22-03047-YGR